



# An analysis of different business models for energy efficient renovation of residential districts in Russian cold regions



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## ABSTRACT

The Russian apartment building stock is old and its energy efficiency is poor. Due to the technical structure of the district heating used in Russia, energy renovations of single buildings seldom lead to reduced energy production. Energy production demands are reduced only if the residential districts and their various utilities and networks are renovated holistically.

This paper analyzes potential business models for energy efficient renovation of Russian residential districts in cold urban regions. After giving background information on Russian housing, the principle idea and planned contents of the Russian district renovations with main stakeholders and business model components are described. Potential business models are identified and their applicability for the Russian district renovations is analyzed. None of the analyzed business models as such suit for the district renovations in Russia but they all would need modifications. Crucial aspects for modifying the ESCO model, selected as the most potential one, are also addressed.

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## 1. Introduction

About 60% of Russia's total multi-family apartment buildings are in need of extensive capital repair (IFC & EBRD, 2012). The Russian apartment buildings are not energy efficient and the losses in heat distribution networks and electricity transmission grids are high (e.g., Bashmakov, Borisov, Dzedzichuk, Gritsevich, & Lunin, 2008; McKinsey & Company, 2009; The European Commission & The Russian government, 2013; The World Bank & IFC, 2008). Building renovation is an important opportunity to upgrade buildings in order to meet current and future energy- and eco-efficiency requirements, including people's increasing needs for improved indoor air quality. The energy saving potential of Russia's residential buildings exceeds 55% of their total energy consumption (UNDP, 2010).

The energy renovation of Russian residential districts requires often improvements to the whole energy chain while many building level renovations would only improve the energy efficiency of the building itself (Paiho, Hoang, et al., 2014). So in Russia, it is important to consider renovation and modernization of whole residential districts. The district renovations would include renovations of the buildings and all their technical systems, modernization of heating energy production and distribution systems, renovation

of local electricity production and transmission systems, renewal of street lighting, renovation of water and wastewater systems, and modernization of waste management systems.

The essence of a business model is in defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments into profit (Teece, 2010). According to Osterwalder (2004), a business model is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams.

Russian Federal Law No. 261-FZ "On Energy Saving and Energy Efficiency..." represents a significant move toward an increase in public awareness of the importance of energy saving, and presents substantial business opportunities for companies working in various sectors of the economy (CMS, 2009). In order to exhaust the opportunities for the reduction of energy and carbon intensity, Russia requires new business models to attract and secure extensive investment funds, and to reduce transactional barriers and risks (Garbuzova & Madlener, 2012).

The aim of this paper is to analyze if there are suitable business models for holistic energy efficient renovations of Russian residential districts in urban cold regions. After giving background information on Russian housing, we introduce the principle idea and planned contents of the Russian district renovations with main stakeholders and business model components. Then, the

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main features of business models identified from the literature are introduced, following the analysis of their applicability for the Russian district renovations. Finally, we conclude by summarizing the advantages and disadvantages of the identified business models and addressing crucial aspects needing modifications by the most potential business model.

### 1.1. The methodology used

The research is based on critical review of scientific and non-scientific literature. In addition, statistics, websites, public documents and newspaper articles were used. Besides, data was gathered through semi-structured interviews with selected Finnish and Russian experts who all had a minimum of 10 years' expertise in the Russian market. The research utilized an iterative process where data was cross-checked and updated when relevant references and sources were found. The analysis was carried out in the following steps:

- A. Describing typical features of Russian housing forming the general background for the study.
- B. Introducing the core contents of district renovations establishing the case studied.
- C. Categorizing and analyzing the main stakeholders who would be involved in district renovations.
- D. Analyzing the business model components in the context of Russian district renovations.
- E. Identifying potential business models from the literature.
- F. Analyzing and discussing the applicability of the identified business models for Russian district renovations.
- G. Selecting the most potential business model and addressing modifications it would require.

## 2. Russian housing

The housing stock of the Russian Federation amounted to 19,650 thousand buildings of the total floor space 3177 mln. m<sup>2</sup> as of 2009 year end (IUE, 2011). The housing stock included 3224 thousand apartment buildings of the total floor space 2237 mln. m<sup>2</sup>. Majority of the apartment buildings were constructed between 1960 and 1985 during the Soviet-era with only a few building types (United Nations, 2004; Trumbull, 2013).

The housing stock in Russia has a rather high level of amenities. An average of 61.4% of housing is provided with all the amenities. In 2009, 89% of urban housing stock had access to water supply, 87% to sewerage, 92% to heat supply, and 80% to hot water. (IUE, 2011)

Total population of Russia is 143 million of which 74% live in urban areas. The average living area per inhabitant is 23.4 m<sup>2</sup> (Federal State Statistics Service, 2014) and the average occupancy rate per flat is 2.7 persons (United Nations, 2004). In 2012 (Federal State Statistics Service, 2014), monthly average per capita money income was 22,880 RUR (approximately €570). As Moscow is the richest Russian region, the average wages there are about the double compared to the national average. Of the money expenditures and savings, purchasing of goods and payment for services forms the biggest share being around 74% while acquisition of real estate is around 4% (Federal State Statistics Service, 2014).

Majority of the Russian housing is privately owned due to the free privatization of the housing stock after the Soviet collapse. The apartments were privatized by the tenants "as is", and the technical condition of the buildings/apartments was not systematically documented at the time. The law on privatization of apartment buildings of 1992 stipulates an obligation of the former lessors of residential units (the Soviet state and municipalities) to carry out the first capital repairs. This substantial involvement of public

authorities in maintenance and renovation of the old housing stock and the so-called yard territories and communal infrastructure is the major significant difference from the practices in Europe. Due to this no-cost transfer of ownership, Russia has become a country of poor owners who cannot afford property maintenance and taxation leading to discussions whether ownerships should be returned back to the municipalities (Shomina & Heywood, 2013).

District heating covers 70% of the total residential heating market in urban areas (Nuorkivi, 2005). Heat distribution losses and electricity transmission losses are high in Russia (Bashmakov et al., 2008). Residential consumers are charged for communal services such as heat, water, sewage, and waste disposal in one bill (Korppoo & Korobova, 2012), where heat is the dominant item, with regional variations of 47–65% of the total. During the last decade (2000–2009), heating tariffs have increased many times in Russia and the rise in heating price has been steeper compared to other utilities (Nekrasov, Voronina, & Semikashev, 2012). Regulated tariffs for residential customers are subsidized and do not reflect the costs of producing electricity (Kuleshov, Viljainen, Annala, & Gore, 2012) nor heating (Korppoo & Korobova, 2012).

According to the Russian Statistics Service (Federal State Statistics Service, 2014), the average cost of capital repair in 2012 across Russia amounted to 4500 RUR/m<sup>2</sup> (€110/m<sup>2</sup>). The recent version of the Housing Code established the obligation for the residents of apartment buildings to pay renovation fees to a renovation fund, which can be used either by the building association itself, provided the residents decide so with majority of their votes (how big majority is needed varies depending on the measure suggested), or by default by a regional operator (Housing Code of Russian Federation, 2013). In several regions, the amount of contributions varies between €0.1 and 0.2/m<sup>2</sup> per month, which is hardly enough to cover the basic costs.

According to a housing survey in St. Petersburg (Herfert, Neugebauer, & Smigel, 2013), only a small proportion of the inhabitants living in large-scale housing estates have considered their residential satisfaction, since to a large extent alternative options in the form of affordable residential offers are not available and the large majority of city dwellers still live in non-refurbished and traditional older buildings.

## 3. Russian district renovations

This section describes the idea of renovating Russian residential district holistically. The focus is on cold urban areas of Russia. In addition, the main stakeholders who would be involved in such a renovation are introduced. The business model components are also presented.

### 3.1. The case – district renovations of residential neighborhoods in urban cold regions of Russia

Typically, the energy efficiency of Russian apartment buildings is poor (e.g., Bashmakov et al., 2008; The World Bank & IFC, 2008). So far, the idea of renovating residential districts holistically is not introduced in Russia. However, it is clear that residential buildings and the related infrastructure is in need of major repairs. Due to the technical structure of district heating used in Russia, the buildings do not include any means to control the heating. Thus, in case only the buildings are renovated and their energy efficiency improved the same amount of heating energy will still be produced.

Table 1 shows the main issues to be included in holistic district renovations in Russia. In principle, all the buildings including all the technical systems and the related energy and water infrastructure would be renovated holistically. The renovations would include upgrading the buildings to more energy efficient ones. In

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